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ABSTRACT

For technology to be integrated into K-12 classroom practice, teacher learning of the technology must occur at the preservice and inservice levels. Three suggested approaches to encourage technology learning and subsequent use by preservice and inservice teachers are: (1) finding the self in the technology (preservice teacher education); (2) "if you build it they will come"--involving teachers in the development of technology tools to encourage use (inservice training); and (3) helping future practitioners toward a vision of themselves as technology-using teachers (the bridge between preservice and inservice). The ideas that fall under these three approaches are suggestive only; teacher educators must decide what activities and approaches are appropriate in their particular settings. It is especially important to continue the dialogue concerning innovative and effective approaches to technology education for preservice teachers. As future teachers feel prepared to teach in a technology-infused classroom, they will help their students interact successfully in a technology-infused society both inside and outside the K-12 classroom. (AEF)

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Authentic Approaches to Encourage Technology-Using Teachers

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Authentic Approaches to Encourage Technology-Using Teachers

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Technology, effectively used, has the potential to restructure schools, and to empower individuals to solve problems creatively and to interact effectively with complex information (Jonassen & Reeves, 1996; Means, 1994). Although schools must enable students to "become information literate and skilled in using computer-based tools" (Rakes, 1996, p.52), Collis (1996) contends that the teacher shapes "the eventual success or lack of success of any computers-in-education initiative"(p. 22). Teachers are key to putting technology in the hands of students by integrating it into the learning environment. By using technology as a natural and necessary part of classroom practice, teachers can give students the knowledge and experiences they need. For students to be better prepared to *learn with* technology, teachers need to be better prepared to *teach with* technology.

Theoretical Framework

There is great interest in the concept of situated cognition as a way to encourage authentic learning. This concept is based, in part, upon a Vygotskyan construct recognizing that knowledge cannot be separated from the situations in which it is used. In an authentic situation, a learner is located at a particular time and place. What is learned in that place is knowledge in context. It is embedded within the activities of that context as well as the meaning derived from that context.

In the forefront of research on the value of situated learning, Brown, Collins & Duguid (1989) argue that learners are hindered in their ability to transfer knowledge when it is not learned in context or in the authentic setting. "Learning and cognition, it is now argued, are fundamentally situated" (p.32).

Helping future educators to perceive technology as meaningful, authentic and necessary for their work as teachers is a goal of many teacher educators. The classroom teacher's work includes both instruction and management. Those of us teaching and using technology in pre-service courses have an interest in our students' ability to transfer these acquired skills into their future classrooms. Not only are we concerned with their technology skills, we also want to generate attitudes and beliefs which facilitate this transfer. In this regard, both cognitive and affective domains are significant and must be considered. To a large extent, a teacher's ability to integrate technology into the classroom depends on the modeling and classroom experience that person had as a pre-service teacher. While there might be some technology modeling in education methods classes, for the most part, the old model which excludes technology still is in place (Ingram, 1992)

Many teacher preparation programs do not place pre-service teachers in the field until their last year of undergraduate study. Therefore, these students have a limited opportunity to explore apprenticeship learning and less opportunity for connecting skills developed in their pre-service classroom to an authentic experience. There are pilot programs that have given pre-service teachers the opportunity to observe technology using teachers in the field and to use technology in their student teaching experiences (Balli & Diggs, 1996; Wetzel & McLean, 1997). These projects have reported a positive effect on teacher candidates in terms of their knowledge and attitudes toward technology. As teacher educators we are concerned with enabling teachers to use technology and to accept and understand technology's role in the classroom.

Purpose of the Paper

For technology to be integrated into K-12 classroom practice, teacher learning of the technology must occur at the pre-service and in-service levels. It is our contention that it is necessary to address ways to bridge these two stages in the professional life of teachers. This paper suggests three approaches to encourage technology learning and subsequent use by pre-service and in-service teachers: (a) finding the self in the technology (pre-service teacher education); (b) "if you build it they will come" - involving teachers in the development of technology tools to encourage use (in-service teacher training); and (c) helping future practitioners toward a vision of themselves as

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technology-using teachers (the bridge between pre-service and in-service).

Pre-service Teacher Education and Technology

We believe that in order for pre-service teachers to consider technology as necessary for their future work in their classrooms, they need to perceive technology as essential to their lives at the present time. The technology modeled in their course work must address ways to assist them with their current challenges as students. Teacher educators must be aware of their students' needs in courses and encourage them to use newly acquired technology skills to meet class assignments. This provides an opportunity for the students to use technology in the authentic context of their present moment.

We have observed the importance of encouraging pre-service teachers to use technology as a means of self-expression. When a student is able to use a tool as a means of self-expression, the value of the tool is increased. The objective in these activities is to develop fluency and skill in the use of the technology as a means of creative self-expression. When this occurs, the student begins to regard the technology as a tool that is as essential as the paint-brush is to the artist.

In the context of the introductory technology course, pre-service teachers explore the use of various technology tools and are assigned to use them in ways, which convey information about themselves. Examples of these activities include using a graphics program to create a "postcard" telling what they dream and creating a HyperStudio stack that reflects their growth over the process of the course (i.e. a reflective portfolio). These activities designed to encourage students to use the technology to express the self. Other activities focused on making the technology relevant to their needs as learners in other classes. The goal was to enable the students to use technology to remedy challenges in their current professional situations. One such activity involved a student who learned how to check out and use a portable computer cart from the media center when she needed to make a presentation in her psychology course. Another student created a PowerPoint presentation on her student organization's marathon dance competition. The presentation helped her explain the dance project to university officials. These students experienced technology as having immediate meaning in their current work. They did not have to save for later the technology skill for "one day, when they will be teachers".

In-service Teacher's Professional Development

Positive attitudes can influence the acceptance of any type of technology. Making people aware of how the technology can help them perform their job can change attitudes. Installing any type of computer tool will be of little value in an instructional environment without dedicated, motivated, and energetic teachers. Yoon, Guimaraes, and O'Neal (1995) note that the ease of use and learning are directly related to the users' positive attitudes toward computer technology. The teacher's perception of computer technologies may depend on whether the computer is viewed as an opponent, supporter, or powerful assistant. Hopefully, when the teachers are involved in the development of computer technology, the computer will be viewed as a powerful assistant.

A study conducted by Zammit (1992) revealed that computer software was not used if it could not support the classroom teachers' tasks. Software that was judged as being instructionally weak or inappropriate was found to be a major factor for non-usage. In addition, several commercial applications designed for teachers can be too generic for teachers' tasks. Thus, this study supports the assertion that teachers need to be involved in the design and development of software to meet their specific needs.

Involving teachers in the development phase of a computer tool designed to meet their specific needs can change their perceptions and attitudes towards technology. Their direct involvement in the product's development enables teachers to envision the capabilities of the technology. The computer tool becomes more meaningful as the teachers experience a sense of ownership. The teachers' input into the development process also assures a more accurate congruency with their needs. These points illustrate the significance of having teachers' feedback recognized as a critical component of the formative evaluation process. Their vision of the completed product and its' anticipated usage acts as motivation for them to accept the technology. This process also encourages confidence building.

Alavi and Napier (1984) describe three different interactions that occur in the rapid or adaptive design process. First, the user-system interaction pertains to how the user's characteristics affect the system utilization as well as how the user's understanding of the decision task and its potential solutions can increase by using the system. Second, the user-builder interaction involves communication and collaboration during the system development process. Third, the builder-system interaction occurs when the builder adds new capabilities and functions to the system as a result of evaluations and new knowledge learned in the decision environment.

These three interactions help to deepen understanding of how and why to use the computer technology. By working with the technology's primary designer and offering suggestions, teachers are being "in-serviced" during the development process. Also, by making design decisions concerning the technology tool, teachers are building a sense of ownership. Training and expert assistance is considered important for encouraging computer usage

(Vockell, Jancich, & Sweeney, 1994). The knowledge acquisition process is an important task for the design and development of technology in education just as it is in the business environment. School personnel are considered the experts in this situation and they must be able to communicate and cooperate with the developers of the system (Telem, 1990).

An example of teachers sharing in the development process is a university-schools partnership project that invited classroom teachers to participate in the design of a computer tool. This computer application is being developed with a modular and rapid prototyping approach for middle school teachers who have been involved since the beginning of the project. An initial prototype of the tool was presented to the participating teachers. Their formative evaluation provided important feedback that was used in refining the prototype. The new prototype was presented again to the teachers and their suggestions were documented for future enhancements. The cycle will continue until all stakeholders are satisfied with the computer tool.

As teachers become confident in using the technology that they helped to create, the skills acquired during the development process can be transferred to similar computer applications. When teachers develop more skill with computer technology, they may see patterns and similarities between computer applications. This may help them in selecting and applying appropriate technology to their daily work processes, such as guiding student learning. This ability to see similar patterns allows for possible transference of what they learn. Heightened motivation is also a factor. (Bassok & Holyoak, 1993). Authentic usage seems to be key. When the technology is used in the context of a real life setting, teachers better understand how to integrate it into their work.

Bridging the Gap

Researchers have provided compelling argument as to the importance of placing pre-service teachers in the authentic setting of the K-12 classroom. One pilot project studied pre-service teachers' placement in an elementary classroom as part of a field experience (Balli and Diggs 1996). The students incorporated technology into a practice lesson that they taught in their observed class. They reported that applying technology-based lessons in the field experience helped them to connect theory and knowledge into practice. They also saw concrete examples of ways in which technology could support learning for children in K-12 settings. The question of transfer from pre-service to in-service was an underlying concern of the researchers. It was their contention that "if pre-service teachers used their newly acquired technology skills in an authentic classroom situation, the experience could enhance their understanding of how technology can support teaching and learning" (Balli and Diggs, 1996, p.57). The results of the students' technology-enriched field experience showed that they had a deeper understanding of how and why to use technology within the structure of the K-12 learning environment.

As the previous description indicated, the authentic context contributed to prospective teachers' transfer of theory into practice. By maximizing the opportunities of a field placement, pre-service teachers can practice and observe their mentor teachers using the technology. As Wetzel and McLean (1997) point out, it is important to place pre-service teachers in classrooms where technology use is modeled "appropriately" (p.53). There are some non-exemplars, classrooms where technology is used in non-innovative ways (Wetzel & McLean, 1997), minimally, or not at all (Bosch & Cardinale, 1993). Work in the field is a salient way to help pre-service teachers experience deep learning of how to effectively and innovatively use technology in their future classrooms. In some instances a field placement is not available to the students when enrolled in the introductory technology course. Although not as optimal as an actual field setting, there are activities the undergraduate instructor can employ that challenge the future practitioner to "think like a teacher".

It is important to help pre-service teachers develop a vision of themselves as technology-using teachers. By helping them "practice" developing effective ways to implement technology in their future classrooms, pre-service teachers will begin to build a framework for how to use technology effectively with their students and as a tool in their work processes. When they situate themselves in the role of a technology-using teacher, they can start to develop an internal sense of how necessary the technology will be in creating a successful, exciting and active learning environment.

Pre-service teachers begin to construct the "bridge" when they describe themselves as technology-using teachers through narratives, role playing and self-as-teacher discussions. In an introductory technology course, pre-service teachers were shown how to use particular technology tools such as database and graphics software, video and digital cameras, and HyperStudio. After the instructor demonstrated these and other tools a discussion of how these tools might be used in the classroom would ensue. While the structure of these discussions would vary (think-pair-share, whole or small group), what was consistent is that the emphasis was on integrating the tool into K-12 classroom practice. In fact, this concept formed the theoretical framework for the majority of the activities in which the students participated. As they placed themselves in the role of teacher, they attempted to specify ways to use the technology to help meet their students needs. Other activities included having students plan technology - enriched lessons and units as if they were members of a grade level team. Decisions about curriculum, budget, and even field trips were discussed within these grade level groups. The group members also appointed a grade level

coordinator. This type of role-playing gives the students the opportunity not only to behave as a teacher but also demonstrates the importance of collaborating and negotiating among colleagues.

Another activity, which helped to put the student in the role of teacher, was scenario-based discussions. The students were given a classroom setting including a profile of the students and learning setting. They then had to apply solutions using technology as a means (not an end) to solving the problem. They could ask further questions of the instructor who served as a mediator with the "insider knowledge" of the learning situation. Questions ranged from details about the school setting to the technology available for classroom use. These scenarios were discussed in small groups and then shared with the class as a whole. These structured activities can give students who do not have the authentic setting available, a way to practice thinking and behaving like a teacher. The link between pre-service and in-service teaching is further built as students integrate into their personal vision of self-as-teacher, meaningful ways to integrate technology into the learning community of their classroom.

Conclusions and Recommendations

Just as every classroom in every school is unique, so are pre-service technology education programs. The ideas described above are meant to be suggestive only, each teacher educator must decide what activities and approaches are appropriate in their particular setting. What seems important is to continue the dialogue concerning innovative and effective approaches to technology education for pre-service teachers. As future teachers feel prepared to teach in a technology infused classroom they will help their students interact successfully in a technology infused society both inside and outside the walls of the K-12 classroom.

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